EPA Region 7 TMDL Review

TMDL ID: IA 04-RAC-0010-1&2 **State:** IA
Document Name: RACCOON RIVER

Basin(s): RACCOON RIVER
HUC(s): 07100006, 07100007
Water body(ies): M RACCOON RIVER, N RACCOON RIVER, N. RACCOON RIVER, RACCOON RIVER
Tributary(ies): BRUSHY CREEK, BUTTRICK CREEK, CAMP CREEK, CEDAR CREEK, HARDIN CREEK, LAKE CREEK, MIDDLE RACCOON RIVER, MOSQUITO CREEK, NORTH RACCOON RIVER, PURGATORY CREEK, SOUTH RACCOON RIVER, WALNUT CREEK, WILLOW CREEK
Pollutant(s): E. COLI, NITRATE

Submittal Date: 12/21/2007 **Approved:** Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

This TMDL was submitted for approval by the State of Iowa in a letter dated December 17, 2007 and received by the U.S. Environmental Protection Agency (EPA) on December 21, 2007. Multiple edits were made on the submittal with the final version received via an internet download on May 19, 2008.

Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

The LC for nitrate is calculated using a load duration curve (LDC) and the WQS of 10 mg/L of nitrate as nitrogen. A general reduction of 48 percent is needed to meet WQS. During the months of May and June the reduction needed is greater than 67 percent. At 50th percentile flow exceedance the LC for nitrate is given in the submittal as 16.9 Mg (metric tons) per day at segments IA 04-RAC-0010-1&2. For segment IA 04-RAC-0200_3 (Middle Raccoon River at Panora) at 60 percentile flow exceedance the LC is 2.92 Mg per day.

The LC for *E. coli* is set based on both the single sample maximum concentration of 235 colonies per 100 mL and a geometric mean concentration of 126 colonies per 100 mL. The LC is expressed with a LDC which uses stream discharge and a WQS target to define the LC at all percentiles of flow exceedance. A reduction of greater than 99 percent will be required to meet WQS. For segment IA 04-RAC-0040-5&6 (North Raccoon River near Sac City) at median flow the LC is 1.02E+12 colonies per day. For segment IA 04-RAC-0040-1 (Raccoon River near Jefferson) at median flow the LC is 8.74E+11 colonies per day. For segment IA 04-RAC-0010-1&2 (Raccoon River at Des Moines) the LC is 5.59E+12 colonies per day.

The LCs given for both nitrate and *E. coli* should result in the achievement of WQS in the targeted segments.

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

The WQS for the segments covered by this TMDL are given in the table below.

Segment ID	designated uses	Impaired use	nitrate criterion	*E. coli* criteria
IA 04-RAC-0010-1&2	Class A, B, and C	Class C (drinking water supply)	10 mg/L as N	----------
IA 04-RAC-0200_3	Class A, B, and C	Class C (drinking water supply)	10 mg/L as N	----------
IA 04-RAC-0010-1&2	Class A, B, and C	Class A (primary contact recreation)	----------	126 cfu/100mL (geomean) 235 cfu/100mL (sample max)
IA 04-RAC-0040-5&6	Class A, B, and C	Class A (primary contact recreation)	----------	126 cfu/100mL (geomean) 235 cfu/100mL (sample max)
IA 04-RAC-0040-1	Class A, B, and C	Class A (primary contact recreation)	----------	126 cfu/100mL (geomean) 235 cfu/100mL (sample max)

The *E. coli* criteria apply during the recreational season from March 15 - November 15.

The segments impaired for Class C use were added to Iowa's 2004 303d list. The segments impaired for Class A use have been on the Iowa 1998, 2002, and 2004 303d list.

These segments were given high priority for TMDL development in the state's 303d list.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

To address the nitrate impairment, nitrate was targeted for LA and MOS. Because most of the point source loads in the basin do not monitor or have permit limits for nitrate, the TMDL targets and assigns loads as total kjedhal nitrogen (TKN). While TKN does not include nitrate it was conservatively assumed in the TMDL that all TKN was converted to nitrate. This does not account for facilities in which ammonia is oxidized to nitrate in the treatment process. Such oxidation is presumed not to exist for WLA purposes. Therefore, TKN is a viable measure of total nitrogen and has a built-in implicit MOS. The WLA is expressed as nitrogen (TKN). The document includes an explanation of the methodologies used in the text and in appendix B.

The linkage for *E. coli* bacteria is direct. *E. coli* is allocated to address the impairment. Both the single sample maximum and the geometric mean criteria are addressed in the submittal. The allocations calculated are based on the single sample maximum so a daily maximum load can be allocated.

EPA agrees with the basis for expressing the TMDL in the submittal for both nitrate and E. coli bacteria.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

Subbasins are described based on United States Geologic Survey (USGS) gaging stations on the North Raccoon, South Raccoon, and Raccoon Rivers. Row crop is the predominant land use in all subbasins and ranges from 61.3 to 85.3% of the areas. In decreasing order of cover the other land uses identified are grasses, woods, roads,

and water. Through the use of SWAT modeling the six subbasins were further delineated and estimates of nitrate and E. coli loading were modeled for each.

Point sources in the watershed covered by this TMDL are 77 National Pollution Discharge Elimination System (NPDES) permitted facilities. Most of these facilities are municipal sewage treatment facilities but there are also industrial, urban storm water, and animal feeding operations. A table listing the facilities' NPDES permit number and name, as well as their WLAs is included in this document in the WLA section below.

In addition to these NPDES point sources the submittal identifies contributions for both nitrate and E. coli from nonpoint agricultural sources, non permitted urban runoff, and natural sources. Nonpoint source agricultural sources include fertilizer (nitrate), soil mineralization (nitrate), legume fixation (nitrate), and manure (nitrate and *E. coli*).

Quantification and subbasin loads of both nitrate and *E. coli* are documented through SWAT modeling to aid in implementation of methodologies to bring the Raccoon River back into compliance with WQS.

The submittal appears to identify all known sources for targeted pollutants.

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.

LCs are given for each impaired segment for each pollutant addressed in this TMDL document. The WLA for nitrate is set at an estimate of current conditions as the submittal demonstrates that point source loads are not a significant cause of the impairment. WLAs for *E. coli* are set at the WQS for the end-of-pipe from each facility. LAs are calculated as the difference between the TMDL and WLA+MOS. The MOS is a combination of implicit and explicit loads.

WLA Comment

Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

The WLAs for all permitted facilities for both nitrogen and *E. coli* are given in the table below separated by subbasin. Through assumptions in the calculations for the nitrate WLA, the TKN is equivalent to total nitrogen. The *E. coli* WLA is 235 cfu/100mL * daily flow.

NPDES No.	Facility Name	Nitrogen (TKN) WLA (Mg/day)	*E. coli* WLA (cfu/day)	
North Raccoon at Sac City				
IA0076554	Rembrandt Interprises, Inc	0.1053	2.8463E+07	
IA0033219	City of Rembrandt	0.0033	5.2390E+09	
IA0046671	City of Fonda	0.0129	9.1082E+09	
IA0025950	City of Laurens	0.0184	1.9924E+10	
IA0065731	Spectra Health Care Fac	0.0008	4.4474E+08	
IA0064998	Tyson Fresh Meats, Storm Lake	1.4800	2.6231E+10	
IA0032484	City of Storm Lake	0.4903	5.5361E+10	
IA0021989	City of Newell	0.0154	1.2159E+10	
IA0034312	Albert City	0.0086	1.3342E+10	
IA0033090	Sac City	0.0336	1.7745E+10	
IA0067652	City of Marathon	0.0036	3.6059E+09	

North Raccoon at Jefferson				
IA0057029	City of Auburn	0.0044	2.6884E+09	
IA0056103	City of Breda	0.0066	1.0674E+10	
IA0062162	City of Lanesboro	0.0126	2.1347E+09	
IA0027189	City of Manson	0.0404	9.1082E+09	
IA0020842	Lake City	0.0294	2.4638E+10	
IA0070114	Twin Lakes Sanitary Sewer District	0.0197	5.2301E+09	
IA0021300	City of Jefferson	0.0567	4.0711E+10	
IA0041998	City of Lake View	0.0157	9.2950E+09	
IA0026026	City of Lohrville	0.0053	9.6864E+09	
IA0020940	City of Lytton	0.2642	1.4845E+10	
IA0033715	City of Rinard	0.0009	4.8921E+09	
IA0032409	City of Scanton	0.0074	1.0852E+10	
IA0033138	Rockwell City	0.0278	8.8948E+10	
Middle Raccoon at Panora				
IA0028983	City of Coon Rapids	0.0159	1.4463E+10	
IA0056855	City of Lidderdale	0.0024	1.2008E+09	
IA0075281	DNR Springbrook State Park - Campground	0.0019	not significant source	
IA0075272	DNR Springbrook State Park - Education Center	0.0006	not significant source	
IA0061468	City of Bayard	0.0066	5.7015E+09	
IA0021377	City of Carroll	0.4635	4.2890E+10	
IA0024571	City of Glidden	0.0154	1.0674E+10	
South Raccoon at Redfield				
IA0035181	City of Dedham	0.0033	4.4474E+09	
IA0041866	City of Guthrie Center	0.0946	1.1777E+10	
IA0075817	City of Halbur	0.0023	9.5174E+08	
IA0036099	City of Redfield	0.0515	3.2555E+10	
IA0068381	Diamond Head Lake	0.0082	2.2237E+09	
IA0041874	City of Bagley	0.0043	3.2466E+09	
IA0057045	City of Panora	0.0554	1.0736E+10	
IA0041858	City of Stuart	0.0210	2.7858E+10	
IA0075361	Rose Acre Farms, Inc. Guthrie Center Egg Farm	0.1680	4.8032E+09	
Raccoon River at Van Meter				
IA0077101	West Central Cooperative	0.0014	7.6762E+09	
IA0057096	City of Callender	0.0050	1.2542E+10	
IA0031216	City of Churdan	0.0046	1.2453E+09	
IA0076244	City of Harcourt	0.0003	3.0420E+10	
IA0023418	City of Minburn	0.0064	7.2937E+09	
IA0060321	City of Paton	0.0026	2.2237E+10	
IA0032824	City of Pomeroy	0.0269	1.2542E+10	
IA0041882	City of Ripley	0.0028	3.5579E+09	
IA0076465	Country View Estates	0.0003	6.2708E+09	
IA0076562	Ortonville Business Park	not a significant source	1.2453E+08	
IA0041921	City of Adel	0.0603	2.8241E+10	
IA0056821	City of Desoto	0.0124	8.8058E+09	
IA0027421	City of Earlham	0.0159	1.3324E+10	
IA0028967	City of Farnhamville	0.0053	2.2682E+09	

IA0020966	City of Gowrie	0.0127	1.4454E+10	
IA0032379	City of Perry	0.4504	7.9217E+10	
IA0002089	Tyson Fresh Meats Perry	0.6864	3.3266E+10	
Raccoon River at Des Moines Water Works				
IA0068888	Iowa DOT Rest Area #21 and 22, I80 Waukee	0.0032	5.3369E+09	
IA0036021	City of Van Meter	0.0132	1.4009E+10	
IA0032794	City of Waukee	0.0628	4.8708E+10	
IA0035319	City of Dallas Center	0.0196	1.9835E+10	
MS4 and CAFO permits				
IA0078638	Storm Lake MS4	BMPs	BMPs	
IA0078875	Waukee MS4	BMPs	BMPs	
IA0079201	E.R. Peterson and Sons	0	0	
IA0080250	Wiederin Feedlot	0	0	
IA0077755	S & S Farms	0	0	
IA0078590	Van Meter Feedyard	0	0	
IA0080284	Ray Lenz, Inc	0	0	
IA0077810	Wendl Feedlot	0	0	
IA0076295	Hy. Vac	0	0	
IA0079731	Corey Agriculture, Inc.	0	0	
IA0080292	Pudenz, Lynn	0	0	
IA0078883	Grimes MS4	BMPs	BMPs	
IA0078867	Clive MS4	BMPs	BMPs	
IA0076767	Vigorena Feeds	0	0	
IA0080390	Vonnhame Farms Trailer Washout	0	0	
IA0079782	City of Truesdale	BMPs	BMPs	

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

The LA for nitrate is set by LA = TMDL - WLA - MOS. With an explicit MOS of 0.5 mg N/L and a WLA of 4.97 Mg nitrogen per day at 50% flow exceedance (691 cfs) the LA = 16.9Mg - 4.97Mg - 0.84Mg = 11.09Mg nitrate nitrogen per day for the Raccoon River segment IA 04-RAC-0010-1&2. For segment IA 04-RAC-0040-5&6 (Middle Fork Raccoon River at Panora) at 60% flow exceedance (120 cfs) with a 0.5 mg/L MOS the LA= 2.94Mg - 0.506Mg -0.01Mg = 2.42 Mg nitrate nitrogen per day.

The LA for *E. coli* at segment IA 04-RAC-0010-1&2 (Raccoon River at Des Moines) the LA for a single sample maximum is determined by LA = TMDL - WLA - MOS. At 50% flow exceedance (972 cfs) with a 35 cfu per 100mL MOS the LA = 5.59E+12 - 9.34E+11 - 8.32E+11 = 3.82E+12 cfu per day. For segment 04-RAC-0040-5&6 (North Raccoon River near Sac City) at median flow LA = 1.023E+12 - 1.709E+11 - 1.524E+11 = 6.997E+11cfu per day. For segment 04-RAC-0040-1 (North Raccoon River near Jefferson) at median flow LA = 8.74E+11 - 1.30E+10 - 1.30E+11 = 7.31E+11 cfu per day.

Margin of Safety

Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.

For both nitrate and *E. coli*, the MOS for all TMDLS can either be implicit or explicit. Both MOS categories were used in nitrate and *E. coli* and the explicit MOS is reinforced for nitrate and *E.coli* through conservative

assumptions implicit in the representation and modeling of point and nonpoint sources.

The nitrate TMDL target of 9.5 mg/L includes an explicit MOS of 0.5 mg/l (10 mg/l TMDL - 0.5 mg/l MOS), thus concluding with an explicit MOS of 5% (0.5 mg/l) used for the 10 mg/l TMDL target. Implicit assumptions were used in modeling the uptake of point source loaded nitrate in the estimation of the current loads.

For the sample maximum target *E. coli*, 35 CFU/100 ml, an explicit MOS, was used which reflects the difference between the fecal coliform water quality standard (200 CFU/100 ml) and the *E. coli* standard. Consistency with numerous TMDLs for *E. coli* that assume *E. coli* concentrations are equal to fecal coliform is achieved from this MOS, as well as representing a greater MOS percentage than assigned to nitrate (approximately 15%). An *E. coli* TMDL target that includes a MOS is 200 CFU/100 ml (235 CFU/100 ml TMDL - 35 CFU/100 ml MOS).

EPA agrees this is an appropriate MOS.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

The months of May and June will require the greatest amount of nitrate reduction. Nonpoint sources contributed more than 95 percent of the nitrate load, with over 68 percent of the days exceeding the TMDL. Analysis of the daily nitrate load data by month was evaluated for seasonal variation in the Raccoon River at the City of Des Moines. Seasonal variation in nitrate loads in the Middle Raccoon River at Panora was evaluated using the LDC that accounted for seasonal and annual variations in stream flow.

E. coli loads in the Raccoon River at the City of Des Moines were evaluated in two methods, the LDC and analysis by month (recreation season months only). In conclusion, *E. coli loads* exceeded the TMDL target more in the spring and early summer compared to the late summer and fall. Spring and early summer are considered the months of April through July.

Seasonality and any critical conditions have been addressed in the submittal.

Public Participation

Submittal describes required public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

Public meetings were held in Jefferson City, Sac City, Guthrie Center, and Des Moines from December 7-13, 2006 to invite public comment and suggestions for the development of this TMDL. These meetings were also held to seek knowledge and experience from concerned citizens and officials.

All four meetings were well attended and included representatives from local city government officials, Des Moines Water Works, North Raccoon Watershed Association, the Hawkeye Fly Fisherman Association, Iowa Farm Bureau Federation, Iowa Soybean Association, Iowa Chapter of the Sierra Club, as well local citizens and landowners. Comments and discussion in these meetings included themes ranging from the increasing numbers of livestock in the watershed, the impact of wastewater treatment facilities, and the changing hydrology of the watershed due to the tile drainage. These comments have been addressed through verbal communications and throughout the TMDL where appropriate.

The draft TMDL was also available on the Iowa Department of Natural Resources web site during the public notice period.

EPA agrees there has been opportunity for meaningful public input to the TMDL.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

On-going monitoring in the Raccoon River is conducted by the USGS, Des Moines Water Works, City of Panora, Iowa State University, and IDNR.

In addition, IDNR has proposed a new monitoring procedure for the Raccoon River, which was been broken down into step intervals shifting the focus of monitoring to smaller basins with the objective of detecting water quality changes. The general methodology is divided into three steps.

Step 1. Target a Basin: Identifying an appropriate basin to invest time, money and effort to monitor, thus allowing limited resources to be used most effectively.
Step 2. Developing a Monitoring Program: After basin selection, develop a monitoring program that includes the elements of monitoring design, sampling locations, sample parameters and sample frequency and duration. The submittal states in depth, that samples for nitrate will be collected bi-monthly, (one sample every two weeks), this considered to be an appropriate balance between weekly sampling that may contain redundant information and monthly sampling that may miss important seasonal or flow correlations. *E. coli* monitoring will also be monitored bi-monthly in conjunction with periodic events.
Step 3. Data Assessment and Reevaluation: Sampling and analytical data should be archived regularly, and data should be evaluated annually to assess the water quality status and trends.

If the proposed monitoring procedures do not meet the stated objectives, the program should be reevaluated and changed if necessary.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.

Reasonable assurances are not required as more stringent LAs are not being allocated in lieu of less stringent WLAs.